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An insole with fabric

The present invention relates to an insole for footwear, ~~as described in the preamble of claim 1~~

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The soles are intended for the relief of the foot, in particular the sole of the foot, by pressure equalisation, as pain in the foot and the sole of the foot in most cases is caused by concentration of pressure. Known soles use liquid contained in one or more cavities. The pressure of the contained liquid is approximately constant, and the soles will then allocate the pressure from the foot over a larger area, whereby pain in the foot or the sole of the foot is reduced. However, it is known that many kinds of material during constant load even below the yield point show permanent cold flow or creep.

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The soles also have the disadvantage, that they cold flow or creep due to the continuing load, to which the soles are exposed. Thereby, the inner volume of the cavities increases so that the pressure-equalising effect is reduced and, along with that, the pain relieving effect. Furthermore, the temperature in footwear is between 20°C and 40°C, in which temperature range, the used plastic foils show a relatively large coefficient of expansion for heat and a relatively large change of elasticity. As a result, the relief decreases as the sole gets warmer.

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DE 40 01 542 describes such a sole, where the cavities are filled with a gas. By using a gas, a higher degree of shock absorption and/or continuing pressure equalisation is obtained, but the gas is more volatile than a liquid. Therefore, it is important that those foils which are used in such a sole have a sufficient low permeability for the used gas. To decrease the permeability and at the same time to increase the strength with regard to creep, the possibility of incorporating a film of, for example, polyethylene or polyurethane in the foils forming the cavities is described. This increases partly the impermeability of the foils and partly the strength with regard to creep. The strength with

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regard to creep comes about by formation of a chemical coupling between the plastic making up the foil and the film contained in the foils.

5 It is a disadvantage that it is necessary to enclose the film in the foils, and for cavities filled with gas, diffusion of the gas is a much bigger problem than creep. The selection of material for the film and the way the film is enclosed in the foils is, therefore, primarily directed towards the purpose of increasing the impermeability rather than increasing the strength with regard to creep. This influences the selection of material, the selection of technique for joining the film and the foil, and the choice that the film is
10 enclosed in the foils.

According to prior art, insoles are known to be covered with different kind of fabric. However, the function of this kind of coverage, as for instance described in US-patents no. 5 067 255, ~~no. 4 017 931~~, and no. 5 025 575 is to increase the comfort. From US-
15 patent no. 3 703 169, an insole is known with an upper layer that is bonded to the insole by means of an adhesive. The upper layer is formed of a material to facilitate the easy insertion of the wearer's foot into the shoe. The fabric covers described in these patents have no described influence on the stability of the insoles.

20 From US-patent 4 906 502, a pressurised insole is known, where the insole is equipped with a fabric inside the insole to maintain the planar structure of the pressurised insole. However, the fabric does not prevent creep of the outer covering.

25 It is the object of the present invention to provide an insole that is primarily intended for cavities filled with liquid, and where the strength with regard to creep of the foils is essentially higher than for known soles, irrespective of whether they are intended for liquids, gasses or gels.

30 This object is accomplished with an insole as described in ~~the characterising part of~~ claim 1.

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5 The fabrics 6, 7 are joined with the foils 1, 2, preferentially with the fibres 13, 14 in the fabrics 6, 7 situated outside an outer side of the foils. ~~The fabrics 6, 7 are in the shown embodiment joined with the foils 1, 2 by placing a film adhesive between the outer side of the foils 1, 2 and the fabrics 6, 7. The joining is done before the foils 1, 2 are joined to form the sole.~~

10 The joining ~~is can also be~~ done in a way that the fabrics 6, 7 are partly enclosed in the foils 6, 7. The fabrics 6, 7 are, thus, joined with the foils 1, 2 by heating the foils 1, 2 whereafter the fabrics 6, 7 are pressed partly into the foils 1, 2. In an alternative embodiment, however, the fabrics 6, 7 can be joined such that the fabrics are entirely enclosed in the foils 1, 2. The fabrics are, thus, joined with the foils 1, 2 by heating the foils 1, 2 whereafter the fabrics 6, 7 are pressed entirely into the foils 1, 2.

15 The foils 1, 2 are made from plastic. Joining of the foils 1, 2 along the edge region is accomplished by hot welding or high frequency welding where the top foil 1 and the bottom foil 2 are pressed together along the edge region 3 at the same time. By the welding, a bead 15 is formed extending inwards into the cavity 4. The bead 15 is formed because the material floats inwards at the location where the welding and the pressing takes place. When liquid 5 or gel subsequently is filled in between the top foil 1 and the bottom foil 2, the cavity 4 is formed.

25 By the formation of the cavity 4, the top foil 1 gets stretched. The thickness t of the material along that part of the top foil 1, which extend in the near vicinity of and from the welding has a thickness which is smaller than the thickness T of the material in the remaining part of the top foil 1. Under load, there is, along that part of the top foil which is stretched, a risk for breakage as a result of creep that can occur in that part, where the strength of the top foil is decreased because of the smaller material thickness t .

30 The fabrics 6, 7 can be of any kind of fabric with fibres 13, 14. The fabrics 6, 7 can be made of synthetic materials as polyester or of natural materials as cotton, or a mixture of fibres of different materials. Furthermore, the fabrics 6, 7 can be woven fabrics,

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CLAIMS

1. An insole for footwear comprising a plastic top foil (1) and a plastic bottom foil (2) and one or more cavities (4), which are formed between the top foil (1) and the bottom foil (2) and filled with a liquid or a gel, and where the top foil (1) and the bottom foil (2) are impermeable with respect to the liquid (5) and are joined together at least along the edge region (3), wherein the top foil (1) as well as the bottom foil (2) are equipped with a fabric (6, 7) extending to the whole of the extend of the foil between the regions (3), where the topfoil (1) is joined with the bottom foil (2), wherein the fabric (6, 7) extends parallel with the foil (1, 2), preferentially extends outside the outer side of the foil (1, 2), and where the fabric (6, 7) is joined with the foil (1, 2) by mechanical joining, ~~wherein characterised in that the fabric (6, 7) is joined with the foil (1, 2) by enclosure in the foil to reinforce the mechanical strength of the foil, where the foil (1, 2) initially is heated up, where the fabric (6, 7) subsequently is pressed partly or totally into the foil (1, 2), where the foil (1, 2) finally is cooled down, whereby that part of the fabric (6, 7), which is pressed into the foil (1, 2), is enclosed in the foil (1, 2).~~
2. An insole according to claim 1, wherein as claimed in any one of the preceding ~~claims characterised in that the bottom foil (2) is equipped with a fabric (7) which with respect to an substantially smooth surface in the bottom of a footwear has a frictional coefficient which is larger than the frictional coefficient of the bottom foil (2) with respect to the substantially smooth surface in the bottom (10) of the footwear.~~
3. An insole according to claim 1, wherein as claimed in any one of the preceding ~~claims characterised in that the top foil (1) is equipped with a fabric (6) which with respect to textile (12) as cotton, polyester or nylon has a frictional coefficient which is lower than the frictional coefficient for the top foil (2) with respect to the textile.~~
4. An insole according to claim 1, wherein as claimed in any one of the preceding ~~claims characterised in that the fabric (6, 7) is made of fibers and is woven~~

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such that the fabric (6, 7) in every direction in the plane of the fabric (6, 7) has a tensile strength that is higher than the tensile strength for the foil (1, 2) in any direction planar with the foil.

- 5 5. An insole according to claim 1, ~~wherein as claimed in any one of the preceding claims characterised in that~~ the fabric (6) which is joined with the top foil (1) is impregnated with a fungicide.